



xploris
SCIENCE

Mammalian Diving Reflex: What happens when our forehead is exposed to cold?

xploris

SCIENCES

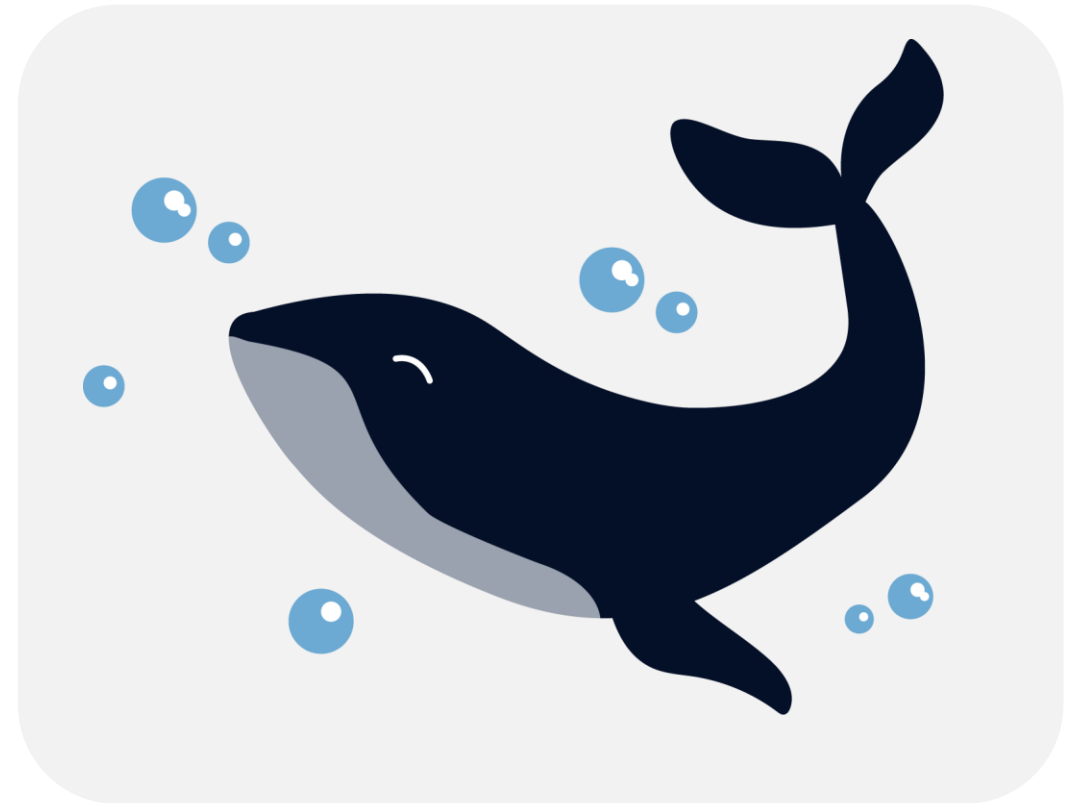
WHAT HAPPENS WHEN OUR FOREHEAD IS EXPOSED TO COLD?

- 1 Introduction
- 2 Setting up the experiment
- 3 Data collection
- 4 Data analysis
- 5 Questions
- 6 Activity summary

1 Introduction

Did you know that when we immerse our forehead in cold water, our body reacts in surprising ways? Just like whales, which have a small bone from their land-dwelling ancestors—the femur—we also have responses in our bodies that have persisted over time.

Today we will explore one of these responses using an Xploris sensor. By placing our forehead in cold water, we will study how our heart rate changes. This activity will show us how our body adapts to cold and how evolution has influenced our responses.

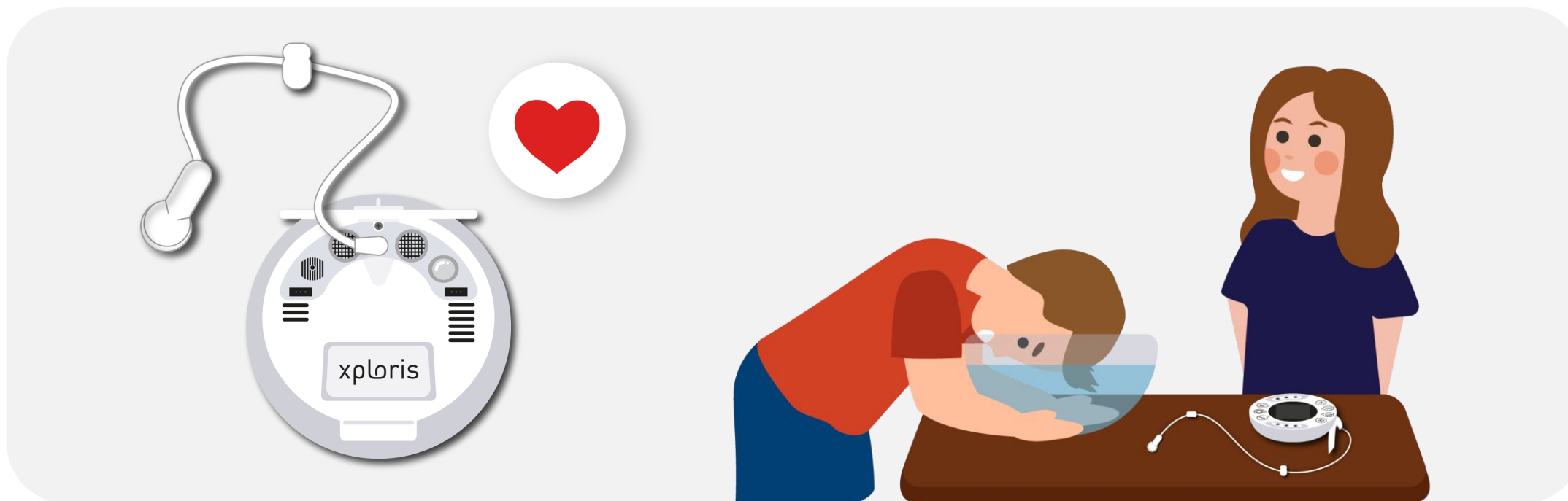


How does my heart rate change when I immerse my forehead in cold water, and what does this reveal about our evolutionary adaptations?

2

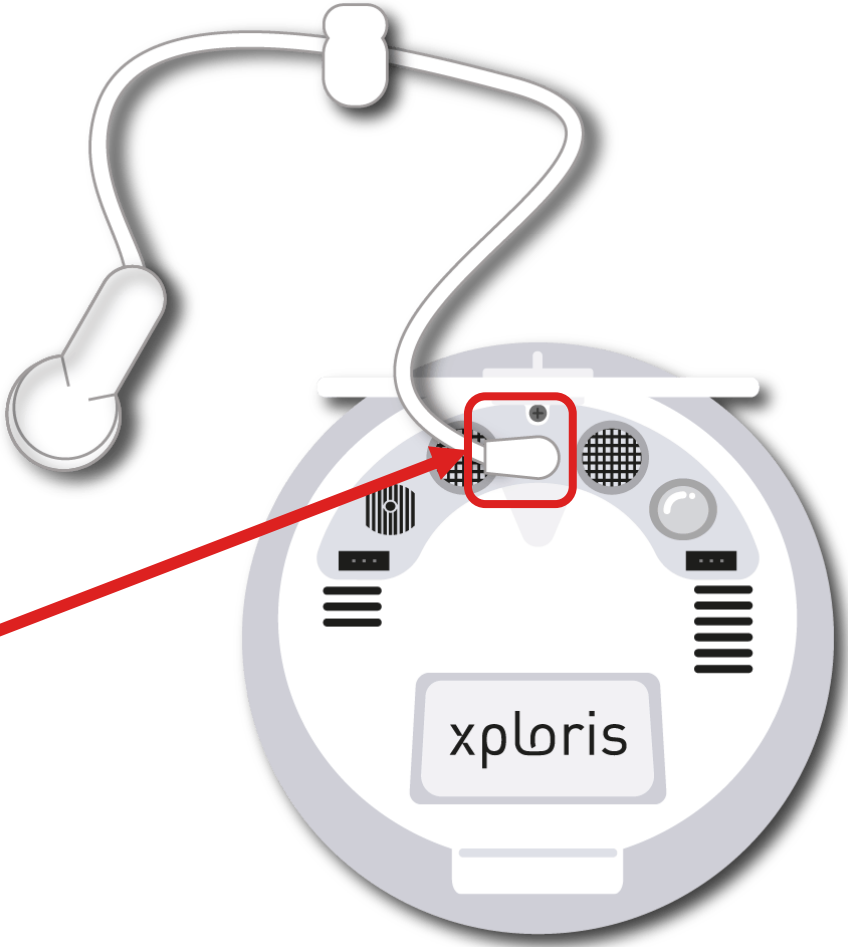
Setting up the experiment

You will begin by measuring your resting heart rate for 30 seconds. Next, submerge your forehead in cold water with ice for 40 to 50 seconds and observe how your body responds. Remember, to take these measurements, you'll need to connect the heart rate probe to the Xploris and your thumb.



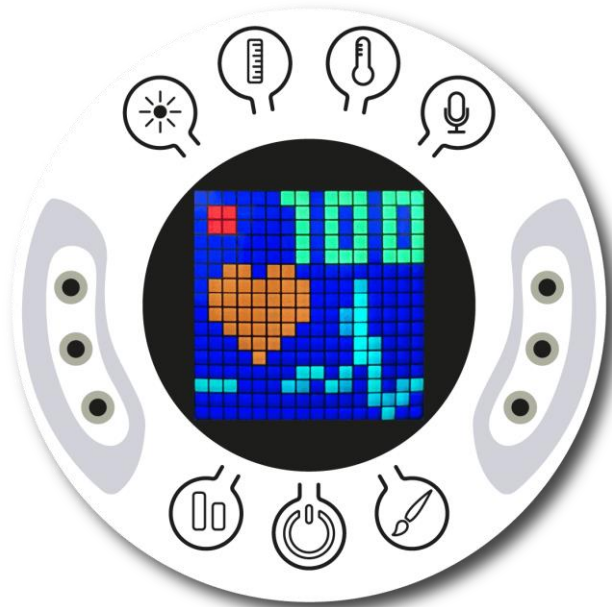
2 Setting up the experiment

Connect the Heart rate clip to the Xploris back input.



2

Setting up the experiment



Turn on your Xploris and connect it to your computer or tablet.



Open the XploriLab software on your computer or tablet.



Once inside XploriLab, select the icon to connect the device via cable or bluetooth as applicable.



Go to the SCIENCE section and then to DATA LOGGER.



2 Setting up the experiment

XploriLab software configuration




To start any configuration related to the sensors, you will select the “setup” icon.





The sensor you will use for this activity is the **heart rate** sensor. You will set it to take **1 sample per second (1/sec)** for a total of 1000 samples.


Once the configuration has been completed, select “Apply” to save it.


Choose Sensor ✕


 Light


 Voltage left


 Voltage Right


 Ext. Temperature


 Amb. Temperature

 Distance

 Speed

 Pulse

 Heart rate ✓

 Sound

Rate

1/Sec ✓

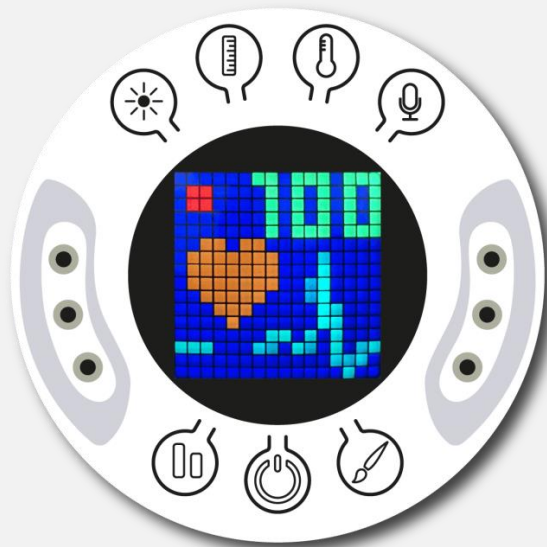
Samples

1 ✓

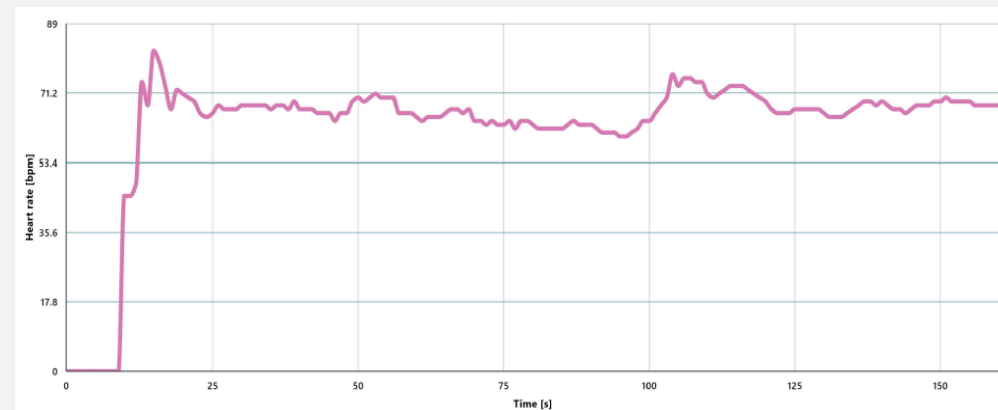
Apply

3 Data collection

Record your heart rate measurements before submerging your forehead, during the immersion, and after removing it from the cold water. Pay close attention to the changes displayed on the graph.



HEART RATE GRAPH



4 Data analysis

1

Use markers on the graph to:

Indicate the measurements taken before immersing the forehead in water, after immersion and when removing the forehead from the water.

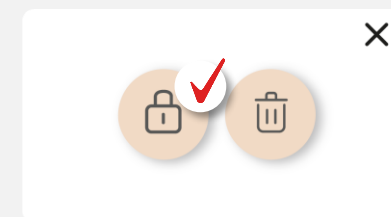


2

Use markers to add labels to the points on the graph. To do this, select the “marker” icon :



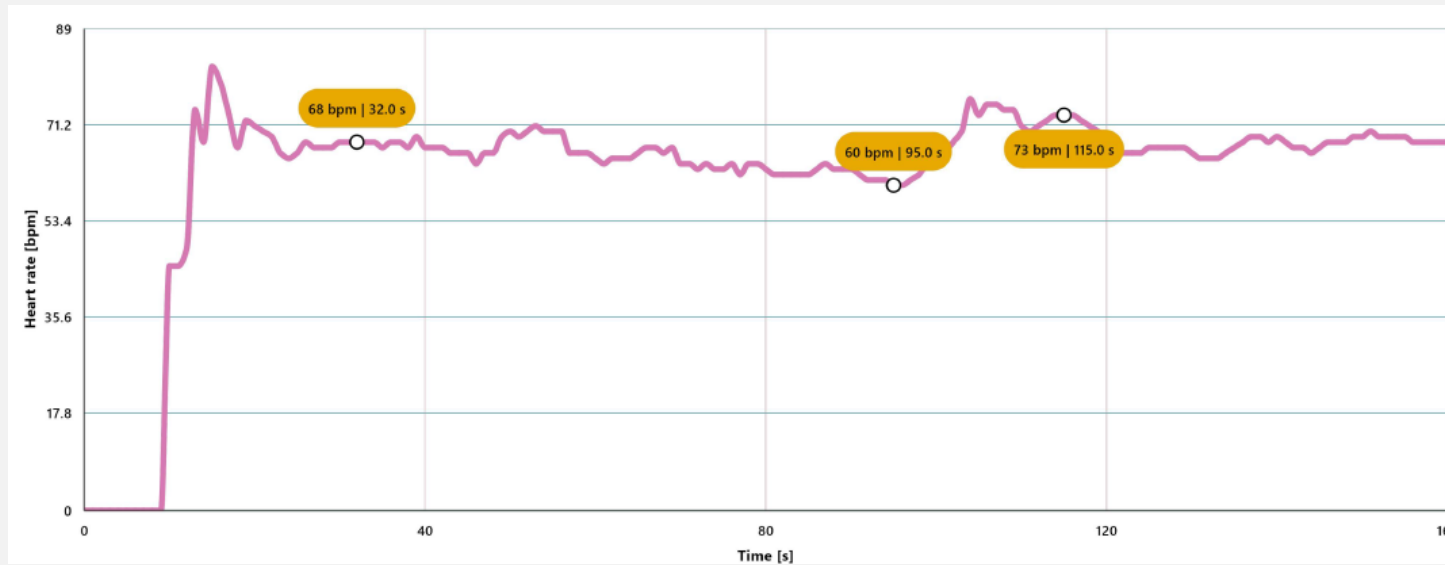
To keep the marker fixed, select it and press the lock icon to secure it.



4 Data analysis

3

GRAPH WITH HEART RATE MARKERS




4

Data analysis

4

To add notes within a graph you must do the following:

1. Select the note icon. 
2. Click on the point where you want to add a note.
3. A dialog box will open and allow you to add the note with text and/or images.
4. Add text to indicate the actions that occurred during measurement.

Write your note



4 Data analysis

5

GRAPH WITH NOTES



5

Questions

1

Let's take a look at the graph

What happened to the heart rate when the forehead was submerged in water?

2

Let's analyze the results

Why do you think this change occurs in our body when we are immersed in cold water?

3

Let's think about our own body!

What conditions does our body need to be submerged underwater, and how might changes in heart rate help facilitate those conditions?

4

Let's investigate!

Now that you've learned about your body's responses, research the **diving reflex in mammals** and discuss its implications with your classmates.

5

Let's keep experimenting!

Do you think the heart rate response would be the same if you immersed your forehead in warm water instead of cold water? Formulate your hypothesis and test it using the Xploris heart rate sensor.

6

Activity summary



We use the Xploris sensor to measure heart rate before, during and after submerging our forehead in cold water.



We analyzed the data to establish what was the change that occurred in our body when we submerged and why this change occurred in our organism.



Finally, we investigated the diving reflex in mammals and changed one of the measurement parameters to see if the same thing happened when immersed in warm water.



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